

a flow passage leading from the lubricant pump stages to the bearing for applying sufficient pressure to the lubricant to induce a film of lubricant between the bearing and the shaft.

2. (Twice Amended) The motor of claim 1, wherein:

the pump stages have a combined capacity to produce at least 30 psi of pressure in the lubricant.

3. (Twice Amended) The motor of claim 1, wherein:

each of the diffusers has a plurality of passages that extend downstream and inward to a central intake of one of the impellers.

4. (Twice Amended) The motor of claim 1, wherein:

each of the diffusers has a plurality of passages that extend downstream and inward to a central intake of one of the impellers; and

one of the impellers discharges lubricant into a chamber in the housing without flowing through the passages of any of the diffusers.

5. (Twice Amended) The motor of claim 1, wherein:

the impeller of each of the pump stages has substantially radial flow passages.

6. (Twice Amended) The motor of claim 1, wherein:

a chamber is located in a lower portion of the housing for containing a volume of lubricant, the chamber being fixed in volume;

the shaft is hollow, and the flow passage is within the shaft for communicating fluid from the chamber to the bearing; and

the pump stages discharge downward.

7. (Twice Amended) An electric submersible pump assembly for a well, the assembly comprising:

an electrical motor having a shaft and a bearing located within a housing that is adapted to be filled and sealed with lubricant;

a chamber located in a lower portion of the housing for containing a volume of lubricant;

a flow passage within the shaft leading from the chamber to the bearing;

first and second centrifugal lubricant pump stages, each pump stage located in the chamber of the housing and each having an impeller attached to and rotating with the shaft and a mating diffuser for pressurizing the lubricant; and

a pump exterior of the motor and connected to the shaft for pumping well fluid.

83
done

8. (Amended) The assembly of claim 7, wherein:

the first and second pump stages have a combined capacity to pressurize the lubricant to at least 30 psi.

9. (Amended) The assembly of claim 7, wherein:

the pump stages discharge downward into a lubricant reservoir of fixed volume within the chamber.

12. (Amended) A method of operating an electric motor having a shaft and a bearing located within a housing that is adapted to be filled and sealed with lubricant, comprising:

434

mounting at least one centrifugal lubricant pump stage in the housing, the pump stage having an impeller attached to and rotating with the shaft and a mating diffuser for pressurizing the lubricant;

supplying power to the motor to cause the shaft and the impeller to rotate; and

with the pump stage, applying pressure to the lubricant and flowing the lubricant to the bearing at a pressure sufficient to induce a film of lubricant between the shaft and the bearing that prevents the shaft from contacting the bearing.

34
cont'd

13. (Amended) The method of claim 12 wherein the pressure of the lubricant is at least 30 pounds per square inch.

New claim:

35

14. The method of claim 12, wherein the step of mounting at least one centrifugal lubricant pump stage in the housing comprises mounting a plurality of the pump stages within the housing.

REMARKS

Applicants have amended the specification to correct a numbering error and to match terminology of the amended claims to the specification. Applicants have amended the claims to better define the invention and overcome the rejection of claim 13 under 35 USC 112. Applicants respectfully traverse the rejection of the claims over the cited art and respectfully request reconsideration.

Referring to Figure 2, in the preferred embodiment of this invention, two pump stages are mounted within a sealed lubricant filled housing 21 of the electrical motor. The pump stages have a combined capacity to provide sufficient pressure to create a fluid film in bearings 27 so that shaft 23 does not contact bearings 27. The pressure is preferably at least 30 psi. The fluid film created by this pressure stabilizes shaft 23 and prevents vibration.

Erickson discloses an impeller 40 located within a diffuser 41 that circulates lubricant downward through passage 24 into a variable volume chamber within bellows 33. The fluid flows through filter 50, which removes water, and passes up passage 11a within the shaft. Some of the lubricant flows through passage 11b to lubricate bearings 12.